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CONTENTS

Rau—Clouds of Butterflies in Mexico: A Study in Butterfly Aggregations (Lepid.: Rhopalocera) 121
Westfall—A List of the Dragonflies (Odonata) taken near Brevard, North Carolina 127
Hull—The Mating Habits of Robberflies (Diptera: Asilidae) 132
Smith—Effect of Reduced Food Supply upon the Stature of Camponotus Ants (Hymen: Formicidae) 133
Fuller—Notes on a Collection of Siphonaptera, Mainly from Pennsylvania 136
Hayes—The Eastern Ant Cricket (Myrmecophila pergandei Brun., Orthoptera, Gryllidae) in Illinois 139
Murray-Aaron—Herbert Morrison in Mexico 142
Wood and Gottschalk—The Butterflies of Roanoke and Montgomery Counties, Virginia (Lepid.: Rhopalocera) 143
Current Entomological Literature 147
Cornman—Thysania zenobia at Woods Hole, Massachusetts (Lepid.: Noctuidae) 150
Obituary—Dr. C. Hart Merriam 150

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ENTOMOLOGICAL NEWS

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Clouds of Butterflies in Mexico: A Study in Butterfly Aggregations (Lepid.: Rhopalocera).

By PHIL RAU, Kirkwood, Missouri.

Tourist guide-books to Mexico often refer to the clouds of butterflies to be seen in certain seasons and places along the Pan-American Highway. One book says that the country between Valles and Tamazunchale for 65 miles is pure tropics; the scenery is lovely, "and the last time we went over the road we drove nearly the entire distance through clouds of butterflies of every conceivable hue." This is no exaggeration, for I experienced exactly the same thing there during the month of July, 1940. This however, does not tell half the story, for they were not only moving in clouds, but the various species were assembled in groups, here and there in the roadside ditches, and each species had its own peculiarities of behavior. Entranced, I lingered for several hours to enjoy a spectacle so extraordinary and colorful, and finally I could not help asking myself what the butterflies were doing—and why they assembled and moved in species-groups as well as in certain color combinations. This phenomenon extended along the highway from Santa Engracia to Valles, and in a lesser degree to Tamazunchale, for a distance of 235 miles.

The clouds pulsating with life and energy appeared only after resting groups had been alarmed into flight by passing traffic. There is a marked difference between the erratic movements of a group when disturbed and the motion of butterflies that glide or flit normally over the countryside.

While some butterflies were on the wing everywhere at all times, the large masses of them were resting in clusters in moist places in the dirt roads or in the roadside ditches, under bridges near streams and in damp culverts. They arose in

wild, agitated clouds only when a passing donkey forced them to move, or when a truck, going at high speed along the highway would create a hurricane of wind that swept them off their feet. They fluttered for some minutes above the spot from which they arose before settling down again to rest, and a few were likely to drift away indifferently until they mingled and settled with another group of the same kind. On the dirt side-road, where the many mud puddles attracted these insects, an automobile plowing through an aggregation of several thousand would create in the bright sunlight a veritable fairyland of motion and color. At first glance the myriads of individuals, the numberless swarms and the many varicolored species of butterflies that festooned the roadside seemed to defy all analysis. Soon, however, the spectator recovers from his bewilderment and begins to discern very definite attitudes and behavior-patterns in the assemblages, as well as certain combinations of color and of species.[1]

The following desultory notes were gathered in the course of an early July day over a stretch of road between Santa Engracia near Rio Purificacion, and Tamazunchale. While the problems involved would require weeks of study, all that could be done in my few hours en route was to observe aggregations here and there and record outstanding features of their behavior in sample groups. The present observations therefore are only an outline for future observational and experimental studies.

I am deeply indebted to Mr. Harold I. O'Byrne for identifying all of the species discussed in this paper.

[1] Belt (Naturalist in Nicaragua) saw large aggregations of butterflies on wet sandy banks "looking like a bouquet; when rising, like a fountain of flowers." He found in groups by themselves 5 or 6 specimens of Papilios greedily sucking up moisture, and "Hesperidae too abounded; and in a favorable afternoon more than 20 different species of butterflies might be taken at these spots" and Bates (Naturalist on the Amazons) observed the sulphur-yellows and orange *Callidryas statira*, *C. eubule*, *C. trite* and *C. argante* congregating on the wet sand. "They assembled in densely packed masses, sometimes two or three yards in circumference, their wings all held in an upright position, so that the beach looked as though variegated with beds of crocuses."

PHOEBIS AGARITHE MAXIMA Neum. and
ANTEOS CLORINDE Godt.

Hundreds of aggregations of these two species were seen in moist places along the dirt road for 11 miles to the Hacienda Santa Engracia at Santa Engracia, Tamaulipas. Often the entire group was composed of the first species alone and sometimes a smaller number of the second kind mingled with them; but the latter were never found making up entire clusters by themselves. *P. agarithe maxima* is a large yellow butterfly whose underwings are satiny pale-green in the sunlight, although pinned, dead specimens appear only yellow and seem to have lost the pale-green shimmer that is so conspicuous in the tropical sun. *A. clorinde* is a white butterfly of approximately the same size, with a large yellow blotch on each upper wing, which is invisible when the wings are closed in repose; there is only a slight greenish tint on the under wings. The yellow ones, *P. agarithe maxima,* were by far the most abundant, and when *A. clorinde* appeared at all, it constituted only from 5 to 10% of the group. Just why the whites never appeared by themselves or why they should be attracted to the yellow groups is hard to decipher; but both species have a greenish sheen on the underside of the wings and when these are exposed to view the color might be the attracting feature. Or since both species belong to the family Pieridae, there may have been sufficient family resemblances or odor similarities to bring them together.

Although these two kinds occurred in aggregations of vast numbers and in many places beside the highway and in the dirt road, they invariably selected a moist area in the bright tropical sun. Coming upon the phenomenon unexpectedly as I did, I soon lost all notion of the enormous number of aggregations seen, but the number of individuals in each cluster varied from 50 upwards (to the best of my ability to estimate) to 2000 or more. And these groups were not far apart, either; often on the dirt road a half-dozen such clusters could be counted in a space of a hundred yards.

In these moist spots in the sunlight, all the individuals of a cluster would quietly rest close to one another, their bodies

almost touching, and the wings tightly closed vertically in the air. Thus they would so remain for long periods of time until disturbed; then the mass would explode unto a swirling, fluttering cloud of yellow and white; after two or three minutes, the excitement would subside and they gradually settled again to the moist earth. We ourselves were compelled regretfully to plow through many such flocks on the narrow road, and we were astonished that they remained undisturbed by the approaching automobile until it was practically upon them; they would not budge from their places of rest until compelled to flee—and then they would dash in pandemonium from under the car in all directions. A few of them, of course, were killed under the wheels, and a few more by the impact of the car, but it was surprising how great a majority of them escaped to safety. One need not be astonished, however, that they do not react to an approaching car, because one may walk to the very outskirts of their ring, stoop down and close the fingers on three or four of them at one time without disturbing their neighbors.

It was interesting to watch the resettling process after a group had been alarmed into flight. When a swarm bursts into action, the butterflies do not fly away but rise in a body and hover wildly over their roosting place. After a few minutes of agitation, several would settle on the ground, sometimes in the identical place and sometimes in a similar moist spot near by. Others would follow flying lower and nearer to this nucleus on the ground, apparently seeking a spot on which to land. These seemed unwilling to drop anywhere and then walk to the desired spot, but were always bent upon alighting in the center of the group, where they would at once come to rest and close their wings. As more and more crowded into the center of the flock, there was much jostling and readjustment of positions of those already there. Thus the circle gradually enlarged as if by the slow flow of the molten gold from the center outward. Often a new arrival would try to alight in the heart of the group where space simply did not exist for him; so he would drop down on the "shoulders" of the others and wedge his

way down between them by wiggling from side to side until his feet too touched the ground.

At two places near Antiguo Morelos, we saw hundreds of *P. agarithe maxima* coming out of the woods, against the wind and flying over the highway; from time to time some of them would drop low and join the groups already formed.

As stated above, the congregations were composed solidly of the large yellows, *P. agarithe maxima,* or of this species with a sprinkling of the large white *Anteos clorinde* butterflies, or again—but very rarely with the smaller yellow butterfly, *Eurema neda nelphe.*[2]

It is unfortunate that a large collection was not taken by which to determine the proportion of sexes on a large scale; those taken for identification were, according to Mr. O'Byrne, all males.

PAPILIO CRESPHONTES Cram. and P. THOAS AUTOCLES R. & J.

These two species of brilliant yellow and black butterflies so much resembled one another that I was surprised to learn that there were actually two species in the clusters. The aggregations were not nearly so abundant as were those of *P. agarithe maxima* and *A. clorinde,* but they occurred frequently. Possibly the proportion would be about 50 to 1. Neither were the individuals in each mass so numerous; they usually varied from 12 to 50, but in the muddy road to Hacienda Santa Engracia several clusters must have contained from 100 to 300 individuals. With their large size and brilliant hues, they made a dazzling bouquet of color. They never mingled with their neighbors, but kept as a unit to themselves, regardless of how near they were to others.

All of the individuals in a group faced in one direction, and that was against the wind. Their wings were closed and held sail-like high in the air. It was easy to learn just how they acquired the uniform position in relation to the wind. When alarmed to flight, they would presently re-settle on the ground, haphazardly facing any direction, and at once close the wings. These would make a perfect weather-vane, which would slowly

[2] See later page.

and gently swing the insect around. So gradual was the change that it was almost imperceptible, until presto! the entire group was facing one way.[3]

Unlike the dense crowding in the yellow-and-white aggregations previously described, the members of these *Papilio* units were always from one to two inches apart. This might be due to the fact that often while at rest they had spells of opening and closing the wings, and they could not have done this without sufficient space. The stately wing movements of these gorgeous butterflies when at rest is a pleasing spectacle to see, for it is done in unison, and with rhythmic motion. The wings are spread about one-quarter open and then closed again with a slow, quivering motion. All move together as if in measured time, for long periods. One wonders if this behavior may be a courtship performance, or merely play to break the monotony of a mid-summer tropical day. These groups were also always in moist places in the sunlight.

All of the material taken for naming proved to be males.

PAPILIO PHILOLAUS Bdv.

This is a very beautiful butterfly of black, decorated with greenish blue bands on all the wings, and with blotches of red on the margin of the hind wings. It was rarely seen in groups, and the few clusters discovered consisted of only 6 to 12 individuals, excepting one group of 25. They too, always kept aloof from other species. The groups were always in bright sunlight, beside the mudholes at the end of the culverts. They were wary, alert and hard to capture; however, late in the day when it became very cloudy, they were easily taken. This suggests that sight may have been the sense that warned them of approaching danger. In these groups they huddled so close to one another, that (when the sky was darkened) by closing two fingers about them, I picked up eight of them at once. These were of both sexes.

Despite the fact that *P. philolaus* did not mingle with other butterflies, they were found only in places where other species also had congregated.

(To be continued.)

[3] In the beautifully colored plate in "Butterflly Travelers" by C. B. Williams (Nat. Geo. Mag. May, 1937, p. 577) a group of *P. marcellus* is shown with "hoisted sails" on a muddy bank all facing one way and Hargitt (Jour. An. Behav., 5: 255, 1915, has observed *Papilio asterios* orient itself in respect to the direction of the wind when coming to rest. He says this behavior "was not merely incidental but definite and purposeful."

A List of the Dragonflies (Odonata) taken near Brevard, North Carolina.

By MINTER J. WESTFALL, JR., Cornell University.

(Continued from page 100.)

23. M. ILLINOIENSIS Walsh. Two males taken on the French Broad River near Long Shoals July 31, 1940, were identified by Mrs. Gloyd. Another specimen from the same locality was collected July 29, 1941.

24. EPICORDULIA PRINCEPS (Hagen). A dozen males were taken on Lake Osceola June 18, 1940, all of which were shot with a gun. Two males were taken at Lake Kanuga on June 13, 1940, with the sling shot. On June 17, 1939, one male was taken with a net and at least one other was seen at Lake Osceola. The dark areas of the wings are quite variable in extent, and often the variations don't seem normal. The specimens when compared with material from Massachusetts seem darker, and the proportions of the male abdominal appendages seem different, but further study of this species and its variations is needed.

25. TETRAGONEURIA CYNOSURA (Say). Common in June and early July on lakes. The variety, *T. c. simulans* Muttkowski has also been taken in the lot of specimens.

26. SOMATOCHLORA TENEBROSA (Say). Fairly common in August and September around camp lake.

27. PERITHEMIS TENERA (Say). Common at Lake Osceola. Also collected at camp lake in August.

28. CELITHEMIS ELISA (Hagen). Abundant at lakes all the summer.

29. C. FASCIATA Kirby. Taken on all the lakes. According to Williamson's key of 1922 the specimens belong to this species and Dr. Calvert has checked them, but none of these specimens has the brownish or yellowish enclosed area on the basal half of the hind wings so characteristic of the Florida specimens; instead this area is clear.

*30. C. VERNA Pritchard. Two specimens were taken on Lake Kanuga in June of 1939. On June 13, 1940, they were

quite common in the marsh at this same lake but very difficult to capture as one had to wade in mud and water to reach them, and they were very alert. Only mating pairs could be taken with a net. A sling shot was used successfully with the single males.

31. ERYTHRODIPLAX MINUSCULA (Rambur). Common almost everywhere around the lakes.

32. LIBELLULA LUCTUOSA Burmeister. Common on the lakes in June and July and quite easily captured in some places. Also seen occasionally until the middle of September.

33. L. AURIPENNIS Burmeister. Only one specimen taken on camp lake in June, 1939, and checked by Dr. Needham. This record is included with some doubt as there has been so much confusion between this species and the following even by experts. The one specimen can't be located to check again on the identification, and all the specimens taken since then have been *L. jesseana.*

*34. *L.* JESSEANA Williamson. I had just completed an extensive study of this species and *L. auripennis* in Florida and could easily recognize this species in the field when it was first seen. About seven specimens were taken on the camp lake and at Lake Kanuga in June, 1940. On June 13, 1940, at Lake Kanuga I noted a male flying in tandem with a female of *L. cyanea* for some time, but several attempts to collect them failed. During 1941 two males and a female were taken at the camp lake on July 18, 27, and August 1, while one was seen on June 12.

35. L. CYANEA Fabricius. Very common on lakes and taken from June 12 to August 11.

36. L. FLAVIDA Rambur. Taken quite commonly on the camp lake from June 19 to August 22. Also collected at Lake Osceola.

37. L. SEMIFASCIATA Burmeister. The first male was taken on the camp lake, June 19, 1941, while another male was collected July 15. Still another was seen at the same place July 20.

38. L. PULCHELLA Drury. Not uncommon on lakes.

39. L. INCESTA Hagen. Common on lakes. Taken from June 17 to August 17.

40. L. VIBRANS Fabricius. Only one male has as yet been taken and this was collected at the camp lake on July 9, 1941.

41. PLATHEMIS LYDIA (Drury). Common on lakes and small streams or ditches leading into them. These dragonflies are found patrolling beats on the streams, flying back and forth, or they may be found far back up in the fields.

42. SYMPETRUM VICINUM (Hagen). Abundant on camp lake in August and September. Many reared from nymphs at camp lake.

43. PACHYDIPLAX LONGIPENNIS (Burmeister). Abundant on lakes. Nymphs quite common in camp lake.

44. ERYTHEMIS SIMPLICICOLLIS (Say). Not uncommon on lakes.

45. PANTALA HYMENEA (Say). Rare. One male taken July 26, 1938, although I believe a few others have been seen in flight.

46. P. FLAVESCENS (Fabricius). Abundant in 1939 on camp lake and elsewhere, but less common since then.

47. TRAMEA LACERATA Hagen. About a dozen specimens taken on the camp lake from June to August of 1939, but none seen in 1940. 25 were collected in 1941 from July 11 to August 2, and many more were seen.

48. T. CAROLINA (Linneaus). Common, especially at camp lake.

*49. CALOPTERYX (AGRION) ANGUSTIPENNE (Selys). Rare. Two or three specimens taken and sent for the Cornell collection to Dr. Needham who has identified them as this species. One female collected on Davidson River, June 20, 1939, was checked by Mrs. Gloyd.

50. C. AMATUM Hagen. One male taken on the Davidson River, August 3, 1941, has the apical fourth of the hind wing dark so is quite distinctly this species. A female taken at the same time would probably be this species also. There is some doubt as to the distinctness of this and the former species by some writers. It may be found that they intergrade into each other.

51. C. APICALE Burmeister. There has been some discussion as to whether this is a good species or not. It is common on

the French Broad River, and has been collected from June to September. Many of these damselflies were also found on the Little River and a few were taken on a small stream leading into Lake Osceola. The specimens have been referred to this species by Dr. Needham.

52. C. MACULATUM (Beauvois). Abundant, especially on small streams. Along tributaries of the Davidson River in June many of them were found, while fewer were seen on the river itself.

53. HETAERINA TITIA (Drury). One male was taken on a small stream leading from Lake Osceola, August 24, 1941, while another male was taken on the French Broad River, August 27.

54. LESTES FORCIPATUS Rambur. Uncommon. Few taken near Brevard, June 16, 1939, and also found at Lake Kanuga.

55. L. RECTANGULARIS Say. Abundant, especially at camp lake, beginning to appear about July 1. Many were reared from nymphs at this lake.

56. L. VIGILAX Hagen. Common at Lake Osceola on August 29, 1939, when about one hundred specimens were collected in a few minutes. Also taken at other lakes, but less commonly.

57. ARGIA APICALIS (Say). Common on French Broad River. A few specimens have been taken each summer at camp lake.

58. A. BIPUNCTULATA (Hagen). Uncommon in the grass of the marshy edges of the lakes.

59. A. MOESTA PUTRIDA (Hagen). This damselfly was for the first time found commonly on the French Broad River near Long Shoals on July 30, 1941. About four males were taken but large numbers were seen. They were especially found at rest on dead brush extending a considerable distance out into the river where it was sunny. Many mating pairs were noted. This species was also found on the Davidson River, August 3 and 17.

60. A. TIBIALIS (Rambur). Common on river banks.

61. A. TRANSLATA Hagen. Four males were taken on the

French Broad River, July 30, 1941, near Long Shoals. Many others were seen.

62. A. VIOLACEA (Hagen). Abundant at Lake Kanuga in June and taken also at other lakes in fewer numbers, and also along the French Broad River.

63. AMPHIAGRION SAUCIUM (Burmeister). Not taken in such large numbers but found at Lake Kanuga, June 13, 1939, and camp lake in June and July.

64. CHROMAGRION CONDITUM (Hagen). Fairly common in June on lakes. Abundant at Lake Kanuga on June 17, 1941, when 30 or 40 males were taken during the morning while collecting other species, and many more were seen. Mating pairs began to appear in the afternoon.

65. TELEALLAGMA (ENALLAGMA) DAECKII (Calvert). One male taken at camp lake August 10, 1939.

66. NEHALENNIA GRACILIS Morse. Abundant at Lake Kanuga in June. A hundred specimens collected in a few minutes by sweeping back and forth through the grass.

67. ENALLAGMA DIVAGANS Selys. Occasional on camp lake.

68. E. HAGENI (Walsh). Found on camp lake and elsewhere in June and July.

69. E. GEMINATUM Kellicott. One female taken at camp lake, June 14, 1941. Five males were collected from lily pads at Lake Osceola on August 11, 1941.

70. E. SIGNATUM (Hagen). Not uncommon on lakes.

71. E. EXSULANS (Hagen). Occasional on lakes, and common at Lake Kanuga in June, 1941.

72. E. DOUBLEDAYI (Selys). Abundant on lakes.

73. E. CIVILE (Hagen). A number taken on lakes, especially in June, also in July. Unusually common in June, 1941, at camp lake, being collected until August 11.

74. E. ASPERSUM (Hagen). Abundant on lakes.

*75. E. BASIDENS Calvert. One mating pair taken at camp lake, June 12, 1940, and identified by Mrs. Gloyd. Dr. B. Elwood Montgomery lists this species from South Carolina, but certainly there are very few published records for this species east of the Mississippi River. In 1941, one male was taken on

June 14 at camp lake. The next day three males were collected at Lake Osceola and on June 17 another was found. On August 11 over fifty specimens were taken, a few females in the lot. Then again on August 24 about thirty were taken at the same lake. Many more were seen.

76. E. TRAVIATUM Selys. Abundant at Lake Osceola on June 13, 1940. A hundred or more were easily taken with a few sweeps of a net. Comparatively rare in 1941.

77. ISCHNURA POSITA (Hagen). Quite common on lakes.

78. I. KELLICOTTI Williamson. Several taken on lily pads in Lake Osceola in September, 1939.

79. I. VERTICALIS (Say). Abundant at Lake Kanuga in June, and several found on other lakes.

80. ANOMALAGRION HASTATUM (Say). Abundant on lakes.

The Mating Habits of Robberflies (Diptera: Asilidae).

The courtship of *Promachus bastardi* Macquart—A female of this species was observed about 4:00 P. M. to alight upon some dense alder bushes about four feet from the ground. While watching it, a male was seen to dart towards it to within about six or eight inches of the resting female. It hung poised before it at this distance and on a level with it, for about two or three seconds whereupon it backed away in a straight line with a speed and facility equal to its onward rush. It poised here perhaps a second, perhaps two, then with a straight rush flew to and pounced upon the female; the male engaged the terminal apparatus of the female with its own, flexed the female's abdomen upward a number of times and all the while was humming, its wings vibrating vigorously; in other respects the female was quiet. After a short period on the shrub as described, about eight to ten seconds, the two flew away in copula and were netted. The female was found to be feeding upon an individual of the common honey bee.

The mating of *Erax interruptus* Macquart.—An individual was found in copula with a female upon the ground, and creeping quite close to it the pair was observed. The male clasped the head of the female, especially the eyes, and for some time tilted the female's head back and forth sidewise.

These observations were made at Oxford, Mississippi; those upon *Promachus* on June 23, 1941, those upon *Erax* several years ago.—FRANK M. HULL, University of Mississippi.

Effect of Reduced Food Supply upon the Stature of Camponotus Ants (Hymen.: Formicidae).[1]

By FALCONER SMITH.[2]

Underfeeding is considered an important factor in the production of minima in colonies of ants. Wheeler (1926) cites observations which show that insufficient food results in the diminution of stature among ant progeny. Ezhikov (1934) suggests that the stases or castes in polymorphic ants develop under conditions similar to those found in a controlled experiment in which experimental groups (minima) feed below optimum. Wesson (1940) shows that underfeeding in a laboratory colony of *Leptothorax* inhibits the production of queens. It is true also among other insects that insufficient larval nourishment produces nanism among imagines, and Herms (1928) finds that smaller adults of species of *Theobaldia* and *Lucilia* follow from larval underfeeding.

It has been possible to explain the occurrence of minima in incipient colonies of *Camponotus* in which the food supply is assumed to be below optimum. It is, however, necessary to seek some other explanation for the production of minima in large and flourishing *Camponotus* colonies where the numbers of foraging ants are great and a correspondingly large amount of food is available to the growing larvae. Variation in the trophic behavior of the nurses towards the larvae may result in the overfeeding of certain larvae and the underfeeding of others, so that the well-fed individuals would become larger pupae. Another explanation for the occurrence of minima in large colonies of *Camponotus* may depend upon the seasonal fluctuations in the food supply received by the colony, but my own observations and those of Pricer (1908) show that the ratio of minima to maxima in colonies of *Camponotus* is nearly constant from season to season. It was thought worthwhile to conduct an experiment in which some of the larvae of a

[1] This study is a portion of the dissertation presented to the Faculty of Harvard University in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

[2] Contribution no. 4, Department of Zoology, University of Tennessee, Knoxville.

large colony of *Camponotus* would be underfed, while other larvae from the same colony received an abundance of food.

A large colony of *Camponotus herculeanus* subspecies *pennsylvanicus* de Geer was taken at Weston, Massachusetts, with the larvae in February 1941. 120 nurse ants were selected at random and distributed among four artificial nests (Fielde type) as shown in the table. Each nest was provided with 100 larvae varying from 1.0 mm. to 1.5 mm. in length. The nests

Nest	No. Nurses	No. Larvae	No. Feedings	No. Pupae Produced	No. Heads Measured	Av. Head Width	Range of Head Widths		Standard Deviation of Head Widths
							Largest	Smallest	
11	30	100	24	54	43	47.5	62	39	3.92
21	30	100	24	60	53	47.3	62	42	4.31
31	30	100	8	25	22	43.8	47	40	2.13
41	30	100	8	31	27	43.9	50	41	2.16

Table to show the effect of reduced food supply upon the stature, etc., of the progeny of a colony of *Camponotus herculeanus* subspecies *pennsylvanicus*.

were maintained for 77 days under as nearly identical conditions as possible except that nests 31 and 41 were given food only 8 times, while nests 11 and 21 were given food 24 times, during the course of the experiment. Experience showed that feeding every 3 to 4 days provided the ants with an abundance of fresh food at all times. A stock food composed of macerated calve's liver sweetened with molasses was used. Distilled water was constantly present in each nest for the ants to drink. Pupae were removed when they appeared in the nests. After the end of the pupation period (about 20 days) the imagines were removed from the pupal covering and the width of the head through the compound eyes was measured with an ocular micrometer. The measurements were tabulated in ocular units. The width of the head was employed as an index of the stature of the ants. See Palenitschko (1927).

It is evident from the table given above that fewer pupae were produced in colonies 31 and 41. This is due to cannibalism of the larvae by the nurses, and to the death of some of the larvae. The average stature of the ants produced in nests

31 and 41 was less than in nests 11 and 21, despite the greater amount of cannibalism noted in nests 31 and 41. The stature of the ants reared in nests 31 and 41 varied less than in nests 11 and 21, as can be seen in the last two columns of the above table. The larger ants produced in nests 11 and 21 were as large as media found in natural colonies, while the smaller ants were somewhat smaller in stature than the minima in natural colonies.

From the experiment just described it is clear that a reduced food supply results in a diminution of the average stature of progeny in colonies of *Camponotus herculeanus* subspecies *pennsylvanicus* and that larger forms with greater variation among themselves result when nutritional conditions for the larvae are more nearly optimum. From this it is seen that underfeeding is at least one factor involved in the production of minima in large colonies of *Camponotus*.

Cannibalism of the larvae increased when the food supply was reduced, but took place even when an abundance of food was provided for the nurses.

References

Ezhikov, T. 1934. Individual variability and dimorphism of social insects. American Naturalist vol. 68 pp. 333-334.

Herms, W. B. 1928. The effect of different quantities of food during the larval period on the sex-ratio and size of *Lucilia sericata* Meigen, and *Theobaldia incidens* (Thom.). Jour. Econ. Ent. vol. 21 pp. 720-729.

Palenitschko, Z. G. 1927. Zur vergleichenden Variabilitat der Arten und Kasten bei den Ameisen Zeits. für Wiss. Biol. Abt. A. vol. 9 pp. 410-438.

Pricer, J. L. 1908. The life history of the carpenter ant. Biol. Bull. vol. 14 pp. 177-218.

Wesson, L. G., Jr. 1940. An experimental study on caste determination in ants. Psyche vol. 47 pp. 105-111.

Wheeler, Wm. M. 1926. Ants, their Structure, Development and Behavior. 2nd Edition 1926, p. 107. Columbia Univ. Press, N. Y.

Notes on a Collection of Siphonaptera, Mainly from Pennsylvania.

By H. S. FULLER.[1]

A collection of fleas belonging to the Carnegie Museum, Pittsburgh, was recently sent by Dr. G. E. Wallace for identification. With one exception (*Pulex irritans*), the specimens were collected in Pennsylvania. As this collection contains several interesting records, the data are presented herewith. The species are listed in the sequence used by Fox (1940) in his recent book.

Family PULICIDAE.

PULEX IRRITANS Linnaeus. Ferryland, Newfoundland, Summer 1937, no host data, 15 males and 46 females (B. W. Brooks).

The record of *Pulex irritans* taken at Ferryland, Newfoundland, is especially interesting. Dr. Wallace writes that the specimens were collected by Drs. B. W. and S. T. Brooks from a bed. The fleas were very abundant in Ferryland and very annoying, biting people during the daytime as well as at night. The inhabitants of the town, a small fishing village near St. Johns, referred to the fleas as dog fleas, and the common belief was that the fleas were acquired from dogs, or were picked up along the beach. Fleas were not noted by Drs. Brooks in nearby St. Johns, although this must not be taken to indicate their absence there.

Ewing (1931) has listed some authentic records of the occurrence of *Pulex irritans* in the United States, based on specimens seen by him. In his list, Fall River, Massachusetts, represents the northernmost point on the eastern seaboard from which this species has been recorded. Fox (1940) mentions no records from New Hampshire or Maine. Buxton (1941) has mapped the approximate recorded distribution of *P. irritans*. The map is based on data obtained from the literature to the end of 1938, and from an examination of tubes of specimens in Tring Museum. On this map, which is too small to show

[1] From the Department of Comparative Pathology and Tropical Medicine, Medical School of Harvard University, Boston, Mass.

exact detail, the distribution of *P. irritans,* as shown by blackened areas, appears to extend up the eastern coast of North America, at least as far north as Massachusetts. There is also an area in the region of Montreal; but New Brunswick, Nova Scotia, and Newfoundland are not indicated on the map as localities from which it has been recorded. Thus the present series of *Pulex irritans,* from Ferryland, provides a new northeastern locality record for this species.

CEDIOPSYLLA SIMPLEX (Baker). Coraopolis, October 13, 1937, off Gray Fox, one female (R. L. Fricke). Clearfield, October 13, 1941, off Rabbit, one male (M. Clement).

CTENOCEPHALIDES FELIS (Bouché). Ligonier, October 3, 1941, no host data, one male (C. D. Ambrose). Pittsburgh, October 21, 1941, off Opossum, one female (G. E. Wallace).

Family DOLICHOPSYLLIDAE.

CTENOPHTHALMUS PSEUDAGYRTES Baker. Linesville, May 25, 1940, off Star-nosed Mole, 9 males and 14 females (R. L. Fricke).

CONORHINOPSYLLA STANFORDI Stewart. Sheakleyville, Mercer County, November 1, 1940, off Fox Squirrel, two females (James Kosinki).

Conorhinopsylla stanfordi, although apparently not common in collections, has been recorded previously from the Red Squirrel (type host), Gray Squirrel, and Flying Squirrel. Thus the Fox Squirrel, *Sciurus niger,* represents an additional host record, and Pennsylvania is a new locality for this species.

OROPSYLLA ARCTOMYS (Baker). Pymatuning Swamp, Linesville, April 14, 1932, off *Marmota* sp., 14 males and 16 females (W. L. Black).

ODONTOPSYLLUS MULTISPINOSUS Baker. Pymatuning Swamp, March, 1933, off Rabbit, 1 male and 2 females (J. K. Doutt). Coraopolis, October 13, 1937, off Gray Fox, one female (R. L. Fricke).

ORCHOPEAS WICKHAMI (Baker). Pittsburgh, November 23, 1940, off Gray Squirrel, 17 males and 41 females (James Kosinki). Pymatuning Swamp, March, 1933, off *Sciurus hudsonicus,* 5 females (J. K. Doutt); March 11, 1933, in arboreal

mouse nest, one male (J. K. Doutt); March 1933, off Flying Squirrel, 4 males and 8 females (J. K. Doutt). Upper Talleycavey, south of Bakerstown, Allegheny County, June 14, 1937, off Fox Squirrel in captivity, 22 males and 27 females (R. L. Fricke).

O. LEUCOPUS (Baker). Dorseyville, February 2, 1940, off *Peromyscus* sp., 3 males and 2 females (O. Brown). Pymatuning Swamp, March, 1941 off *Peromyscus* sp., 5 males and 27 females (J. K. Doutt); March, 1941, off *Microtus* sp., one female (J. K. Doutt); March, 1933, off *Zapus* sp., one female (J. K. Doutt).

Family HYSTRICHOPSYLLIDAE.

HYSTRICHOPSYLLA GIGAS TAHAVUANA Jordan. Linesville, May 25, 1940, off Star-nosed Mole, one female (R. L. Fricke).

Hystrichopsylla gigas tahavuana is likewise an uncommon flea in collections, and it is remarkable for its large size. The present specimen represents a new host and the first record for Pennsylvania.

EPITEDIA FACETA (Rothschild). Pymatuning Swamp, March, 1933, off *Sciurus hudsonicus,* one female (J. K. Doutt).

Epitedia faceta was described by Rothschild (1915) from male and female collected at Wilbraham, Mass., off *Sciurus hudsonicus.* No further records are known to the writer and he has not examined the types. The present specimen is somewhat damaged, the head and foreleg having separated from the body, although they are mounted on the same slide. The specimen is differentiated from *E. wenmanni* and *E. testor,* on the basis of characters of the genitalia and the seventh sternite. The receptaculum seminis possesses a long sausage-shaped head which is much longer than the tail, in agreement with *E. faceta,* and differing from the other two species. Furthermore, the seventh sternite is divided by a wide shallow sinus into two lobes of about the same size and shape. The upper lobe is not acuminate, and it does not extend further distad than the lower one. These points of distinction seem to justify the determination of this specimen as *Epitedia faceta.* It is to be hoped that further material from the same source will be collected in the future.

LITERATURE CITED.

BUXTON, P. A. 1941. The Recorded Distribution of Certain Fleas. Bulletin of Entomological Research, 32, part 2, pp. 119-122, August.

EWING, H. E. 1931. Some Factors Affecting the Distribution of and Variation in North American Ectoparasites. The American Naturalist, 65, pp. 360-369.

FOX, IRVING. 1940. Fleas of Eastern United States, pp. i-vii + 1-191, Ames, Iowa.

ROTHSCHILD, N. CHARLES. 1915. On *Neopsylla* and Some Allied Genera of Siphonaptera. Ectoparasites, 1, part 1, pp. 30-44.

The Eastern Ant Cricket (Myrmecophila pergandei Brun., Orthoptera, Gryllidae) in Illinois.*

By WM. P. HAYES, Department of Entomology, University of Illinois.

Six species of ant crickets of the genus *Myrmecophila* have been described from the United States but only four are now regarded as valid (Hebard, 1920, Trans. Amer. Ent. Soc., 46:91). Comstock (1924, Intro. to Ent., 1st ed., p. 249) called these small gryllids, "ant-loving crickets" but in Europe they are generally known as "ant-crickets." These insects are commonly found in the nests of ants but have been taken alone in or under logs where no ants were found. Their food is supposed to be the secretions from the bodies of ants which are said to be "licked" up by the crickets, with their hypopharynx.

Of our four American species, three (*M. nebrascensis* Lugger, *M. oregonensis* Bruner and *M. manni* Schimmer) occur only west of the Mississippi, while *M. pergandei* Brun. is the only species found in the eastern states. The range of *M. pergandei* extends westward to Nebraska and southward to Florida. Hebard (*l.c.* 1920) has cited the northward distribution as Maryland, District of Columbia and Virginia. Indiana

* Contribution No. 224 from the Entomological Laboratories of the University of Illinois, Urbana, Illinois.

specimens have been found only in the southern half of the state. In Hebard's revision of the genus no records of distribution were known for Illinois. His more recent work (1934, Orth. and Derm. of Ill., Ill. State Nat. Hist. Surv., Bul. Vol. 20, p. 257) records the finding of *M. pergandei* in three places in southern Illinois. In this work he stated, "Though Murphysboro is a northern limit this inhabitant probably occurs throughout southern Illinois, as it is known from Indiana as far north as Mitchell." According to Hebard (*l.c.* 1934), Illinois records of this species are from Shawneetown, Murphysboro and Olive Branch. The Shawneetown specimens were collected in April, those at Murphysboro in May and those at Olive Branch in September. The latter collection included six young.

During the summer and autumn of 1941 three collectors have found this species in ant nests in the vicinity of Champaign and Urbana, Illinois, which is about 175 miles farther north in Illinois than the Murphysboro record. Mr. James Slater found specimens in an undetermined ant nest within the City of Urbana on August 13, 1941. Mr. Bernard Berger found one female in an ant nest at Urbana on August 12 and 1 male in another nest on October 6 in Champaign. The writer took one specimen on April 17 at Urbana in the nest of the cornfield ant, *Lasius niger americana.*

Mr. Berger's specimens are deposited in the Illinois State Natural History Survey collection and also in this collection are one male, one adult female and two female nymphs collected in the nest of the acrobat ant, *Cremastogaster lineolata,* by Mr. Floyd G. Werner in LaSalle County, Feb. 12, 1938, much farther north than Urbana. The Field Museum collection at Chicago has specimens from Summit, Illinois, near Chicago, 300 miles north of Murphysboro and from Olive Branch so that it is probable that the species is distributed all over the state. The specimens from Olive Branch were collected in September and October, 1909, while the Summit specimens were taken by H. Dybas, April 11, 1941. Mr. Rupert Wenzel, of the Field Museum, recently stated (unpublished)

that these ant crickets are taken commonly at Summit, Argo, Justice and other points along the Illinois drainage canal in the spring and that they occur with ant hosts of different genera.

The Western species, *M. nebrascensis*, is thought by Hebard (1920, *l.c.* p. 111) to be the species referred to by Lugger (1898, Orth. of Minn., Third Ann. Rept. State Ent. Minn.) in his reference to an undetermined species from Minnesota. Since the known northern range of *M. nebrascensis* is Nebraska, it is possible, since *M. pergandei* is known from so far north in Illinois, that Lugger's reference may have been to *M. pergandei*. Lugger figured a dorsal and side view of a species which he called *M. nebrascensis* and which Comstock (1924, Intro. to Ent., 1st Ed., p. 249) has used under the name of *M. pergandei*. Hebard (1920, *l.c.* p. 92) pointed out that all the four American species "are very closely related and may eventually prove to be geographic races of one species."

The following ants have been cited by Hebard (1920, *l.c.* p. 95) as hosts of *M. pergandei*: *Cremastogaster lineolata, Aphaenogaster treatae, Lasius umbratus, Formica fusca, Formica pallidefulva, Formica truncicola, Camponotus herculeanus,* and *Camponotus castaneus.* The observation recorded above of its occurrence in the nest of *Lasius niger americana* is new, although the western species, *M. manni* Sch. has been recorded with *"Lasius niger."*

The life histories of American species have not been studied. Wheeler (1900, Psyche, 9:111), Schimmer (1909, Zeits. Wiss. Zool., 93:409) and Hebard (1920, Tr. Amer. Ent. Soc., 46:91) have made observations on their biology. Schimmer has studied in detail the external and internal morphology of the European *M. acervorum.* He figured the egg and has noted that egg-laying in this species occurs from May to October (6 months). Both nymphs and adults hibernate in ant nests and at least two and probably three years are required to complete their life history in Europe. The finding of nymphs and adults of *M. pergandei* on February 12, 1938, in LaSalle County by Mr. Werner suggests a similar life history for our American species. Schimmer (*l.c.* 1909) has included an extensive bibliography in his paper.

Herbert Morrison in Mexico.

By the late EUGENE MURRAY-AARON, Field Museum, Chicago.*

In the almost endless task of solving bibliographic puzzles in Rhopaloceran taxonomy I seem to have overlooked an item of collecting history that I could have set at rest long since. On page 27, of their list of Diurnal Lepidoptera, Barnes and Benjamin, questioning the right of *Megathymus drucei* Skinner to membership in our boreal fauna, say:

"This name * * * is credited to our fauna by Skinner and Williams, 1924, Trans. Am. Ent. Soc. L, 208, on the strength of a statement by Schwarz, 1897, Proc. Ent. Soc. Wash., IV, 209, that Morrison's material came from near Fort Grant in the Graham Mts., Arizona. This refers to Coleoptera. At least some of Morrison's Lepidoptera appear to have been collected in the Huachuca Mts., and it is not unlikely that Morrison did get into Mexico."

It seems strange that Schwarz, writing barely a decade after the event, should have been at all uncertain on the Morrisonian wanderings. I knew Herbert Morrison quite intimately, visited him at his home, Morganton, North Carolina, 1878, where he first went to escape the inevitable, lurking for him in New England winters. In search of a land where t.b. victims could

* This article was submitted by its author in November, 1939, for publication in Entomological News. On acknowledging its receipt, it was suggested to him that he add the dates, as detailed as possible, of Morrison's collecting trips in Arizona and Sonora, from his correspondence. A reply "for Dr. Murray-Aaron," of January 8, 1940, stated that he had a very serious cold but that as soon as possible he would reply to the inquiry for data regarding the Herbert Morrison collecting trips. Waiting for this information, nothing further was done in the matter until September, 1941, when assistance was sought of Mr. William J. Gerhard, of the Field Museum. Mr. Gerhard answered October 4, 1941: "I fear that the dates of Morrison's collecting trips in Arizona and Sonora will prove unattainable, for Dr. Eugene Murray-Aaron died on Friday, September 20, 1940, at the age of 86, and he was buried on the following Monday afternoon. I do not know how well he kept his notes and correspondence, but I doubt that his wife would be able to supply the desired information." As it does not appear that anything will be obtained by further waiting, the article is now published in the form in which Dr. Murray-Aaron sent it to the News. Those versed in ancient history will recall that he was the first editor of Entomological News, January and February, 1890.—EDITOR.

live and be fairly active, he later went to Arizona. Later I joined him in the Graham mountain region for a short visit. From there we crossed into the state of Sonora, Mexico, collecting somewhat around Nogales and finally going for a brief trip south to Hermosillo. Judging from correspondence of that far off day, now more than a half century past, Morrison later collected as far south as Guaymas, on the Gulf of California. Of one thing I am positive, I have data of Hesperids, on labels in his unmistakable handwriting, collected at Hermosillo. And of another thing; there never went forth from this land a more carefully exact collector than Herbert Morrison. He was as conscientious regarding data, as he was careful in handling specimens or bravely optimistic to the very last of an all-too-short, but worthwhile life. If his label said "Arizona," that state it was; if "Mexico," then the specimen was caught south of the boundary.

The Butterflies of Roanoke and Montgomery Counties, Virginia (Lepid.: Rhopalocera).

By CARROLL E. WOOD, JR. and CARL W. GOTTSCHALK.

After six years of rambling over the Virginia hills catching butterflies, while being thought crazy, feeble-minded or merely peculiar; after being chased out of fields, accosted for a fishing license, and called upon for lengthy explanations of their actions, the writers feel they have accumulated enough material to attempt at least a partial account of the butterflies of the Roanoke area.

Although scattered papers have appeared from time to time concerning the butterflies of western Virginia, the only lists of them from this region that have been published are an incomplete list of the species occurring in Rockbridge County, northeast of Roanoke County, by the Rev. Ellison A. Smyth, IV[1], and a list of the species found in two week's collecting on Apple Orchard Mountain in Bedford County, adjoining Roanoke County on the east, by Dr. Austin H. Clark[2]. Col. Wirt Rob-

[1] The Raven, 9: 56-58, July, 1938.
[2] Proc. Biol. Soc. Wash., 47: 177-180.

inson, U. S. Army, sent many specimens from Nelson County to the Hon. Walter (later Lord) Rothschild and some of these are listed in Rothschild and Jordan's revision of the American swallowtails.

In the course of 34 years of collecting, from 1891 to 1925, while Professor of Biology and Dean of the Faculty (1902-06) of the Virginia Polytechnic Institute, the late Dr. Ellison A. Smyth, Jr., found 92 species and subspecies of butterflies in Montgomery County, mostly from the area around Blacksburg. He was so kind as to allow us free access to his large collection and the use of his records. The Montgomery County records, with the exception of that of *Erynnis zarucco* which was taken by Dr. Clark, are accordingly taken from Dr. Smyth's collection which remains at his home in Salem.

Several of the Roanoke County records are also the result of Dr. Smyth's collecting which he carried on in Salem after his retirement.

During the past six years, the authors have taken 92 species within Roanoke County. An additional species, *Phoebis philea*, was taken by Dr. Smyth, and is the only record of this butterfly for Virginia.[3] Of these 93 species, 12 are not known from Montgomery County, while 12 of those from Montgomery are unknown from Roanoke County, thus making a total of 105 species and subspecies from both counties. It is more than probable that many of the twenty-four known from only one county or the other occur in both, but have simply evaded the collectors' nets.

Location and Topography of the Area.

Roanoke and Montgomery Counties are situated in southwestern Virginia near the southern end of the Shenandoah Valley, the main valley highway, Route 11, crossing both counties more or less in the central portion. Roanoke County with the county seat at Salem, eight miles west of the city of Roanoke, has an area of 305 square miles, while adjoining Montgomery County, with the county seat at Christiansburg, has an area of 401 square miles.

[3] Clark, Proc. Biol. Soc. Wash. 51: 1-6.

Both counties have a very diversified terrain ranging from the gently rolling, intensively cultivated valley floor which rises westward from an altitude of 1,006 feet at Salem to 2,007 feet at Christiansburg, to the crests of the Alleghenies at an altitude of about 4,000 feet. The mountains are now clothed with second growth woods, none of the original forest cover having been preserved in either county.

The drainage of all of Roanoke County and the eastern portion of Montgomery County is toward the Atlantic. The Roanoke River, rising in the latter county and draining most of the area, cuts through the Blue Ridge at the eastern line of Roanoke County and then flows southeastward into Albemarle Sound in North Carolina. The western section drains into the New River which, forming the greater part of the western boundary of Montgomery County, flows across West Virginia and, becoming the Great Kanawha, joins the Ohio at Point Pleasant. The New River is of particular interest here because it pierces the high mountains along and beyond the northwestern borders of Montgomery and Roanoke Counties which form more or less of a barrier to the entry of species from the region of the Mississippi Valley. Before the settlement of this region, the buffalo migrated along this river valley to and from Virginia, and it is possible that certain butterflies may also have entered by this route.

Faunal Zones and Components.

The valley floor in Roanoke County lies in the *Upper Austral* or *Carolinian Life Zone.* Above the valley floor most of the area of both counties belongs primarily to the *Transition* or *Alleghenian Zone,* the predominant life zone in the mountainous western portion of Virginia. Presumably before the mountains were deforested, the higher altitudes were inhabited by faunal elements of the southern extension of the *Canadian Zone,* but these have almost wholly disappeared from both counties, the Transition Zone fauna, intermixed with various Austral elements, being dominant to the mountain tops. However, the most characteristic butterfly of the southern extension of the Canadian Zone, *Polygonia faunus smythi,* is known from Montgomery County and is common on the high mountains not far

away in Giles County. Also known from the area are *Incisalia polios* and *Pyrgus centaureae* which should probably be regarded as Canadian.

In the area covered, a large part of the butterfly fauna cannot be regarded as belonging typically to the Transition Zone. However, a number of species *are* more or less confined to this zone. Among the more characteristic of these seem to be:

Satyrodes eurydice	Rhabdoides cellus
Polygonia progne	Erynnis brizo
Euphydryas phaëton	Erynnis icelus
Phyciodes nycteis	Hesperia metea
Argynnis bellona	Hesperia leonardus
Argynnis idalia	Hesperia sassacus
Argynnis diana	Polites mystic
Argynnis aphrodite	Poanes hobomok
Nymphidia borealis	Atrytonopsis hianna
Glaucopsyche lygdamas	Amblyscirtes hegon
Strymon liparops	

It will be noted that these are, for the most part, species which stay rather close to home and do not fly great distances.

In addition, several forms usually associated with the *Upper* or *Lower Austral Zone* have been taken in the area. Chief among these are:

Strymon m-album	Eurema nicippe
Atlides halesus	Polites brettus
Phoebis philea	Lerodea eufala
Eurema jucunda	Panoquina ocola

A. halesus, P. philea, P. brettus, as well as *E. jucunda,* are clearly summer or casual visitors; the first three are known from but a single example each, taken in late summer or fall. *E. jucunda* appears in July and flies until frost, apparently dying out during the winter. All specimens of *jucunda* that we have taken are apparently offspring of the earlier migrants to this region, as all have been practically "scale-perfect" specimens, indicating that they have not flown any appreciable distance. The complete absence of the earlier brood of *jucunda* indicates that this species does not successfully survive the winter months here. Perhaps *L. eufala* and *P. ocola* also become temporarily established in this region in summer, but it is doubtful that they overwinter. *Eurema nicippe,* however, has been found to overwinter successfully in Roanoke County, for unworn examples are frequently taken in early April. These vernal specimens, as well as those captured in late fall, are reddish below on the hind wings, instead of yellow as in the summer examples.

(To be continued.)

Current Entomological Literature

COMPILED BY THE EDITORIAL STAFF.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the current or preceding year unless otherwise noted. All continued papers, with few exceptions, are recorded only at their first installment.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Note. References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of **Entomological News** for 10c. The number of, or annual volume, and in some cases the part, heft, &c., the latter within ( ) follows; then the pagination follows the colon :

Papers published in the Entomological News are not listed.

GENERAL.—Anon.—Retirement of Dr. Arthur Gibson. [4] 74: 36. **Coyner, W. R.**—Insect distribution and seasonal succession in overgrazed and normal grasslands. [Univ. Oklahoma Bull.] No. 850: 105-106. **Knowlton, G. F.**—Insects in killdeer stomach. [19] 37: 23. **Lemmer, F.**—Obituary by G. P. Engelhardt. [19] 37: 4-5, ill. **McKeown, K. C.**—Strange insect meals. An entomological by-way. [Australian Mus. Mag.] 7: 397-398. **Nemeth, F. F.**—Insect galls of West Virginia. [Castanea] 7: 16-19, ill. **de la Torre-Bueno, J. R.**—A brutal way to clean insects. [19] 37: 19-20. On color characters as specific criteria. [19] 37: 9.

ANATOMY, PHYSIOLOGY, ETC.—Butler, C. G. and D. J. Finney—The influence of various physical and biological factors of the environment on honey bee activity. An examination of the relationship between activity and solar radiation. [Jour. Exp. Biol.] 18: 206-212. **Campbell, W. G.**—The relation between nitrogen metabolism and the duration of the larval stage of the death watch beetle (Xestobium rufovillosum) reared in wood decayed by fungi. [Biochem. Jour.] 35: 1200-1208. **Ewer, R. F.**—On the function of haemoglobin in Chironomus. [Jour. Exp. Biol.] 18: 197-205. **Gunn, D. L. and H. S. Hopf**—The biology and behavior of Ptinus tectus (Col. Ptinidae) a

pest of stored products. II The amount of locomotor activity in relation to experimental and previous temperatures. [Jour. Exp. Biol.] 18: 279-289. III. The effect of temperature and humidity on oviposition, feeding and duration of life cycle. [Ib.] 290-305. **Pyle, R. W.**—The fiber tracts of the fused thoracic ganglia of the adult Ephestia kuehniella (Pyralid.). [5] 48: 123-128, ill. **Shull, A. F.**—The mechanism through which light and heat influence genetic factors for wing development in aphids. [42] 89: 183-196. **Trim, A. R.**—Studies on the chemistry of the insect cuticle. I. Some general observations on certain Arthropod cuticles with special reference to the characterization of the proteins. [Biochem. Jour.] 35: 1088-1098. **Vazques, L. y M. T. B. Villasenor**—Estudios acera del sistema nervioso de los insectos. I. La celulas neurosecretoras en il sistema nervioso del cucarachon de agua (Benacus griseus Say). [112] 12: 773-779.

ARACHNIDA AND MYRIOPODA.—Bryant, E. B.—Notes on the spider fauna of New England. [5] 48: 129-146, ill. **Petrunkevitch, A.**—A study of amber spiders. [Trans. Conn. Acad. Arts & Sci.] 34: 119-464 pp., ill.

THE SMALLER ORDERS OF INSECTS.—Breland, O. P.—See under Diptera. **Linduska, J. P.**—Bottom type as a factor influencing the local distribution of mayfly nymphs. [4] 74: 26-30.

ORTHOPTERA.—Adamson, A. M.—Mole-cricket parasites of the genus Larra in Trinidad. [Trop. Agric. Trinidad] 19: 43-45. **Gurney, A. B.**—The study and collecting of Zoraptera. [Ward's Nat. Sci. Bull.] 15: 69-71, ill. **Knowlton & Stains**—See under Diptera.

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DIPTERA.—Breland, O. P.—Robber fly and dragon fly. [19] 37: 35. **Dalmat, H. T.**—A new Cuterebra (Cuterebrid.) from Iowa with notes on certain facial structures. [119] 27: 418-421, ill. **Harmston & Knowlton**—The dipterous genus Campsicnemus in North America. [19] 37: 10-17, ill. (k*). **Hull, F. M.**—Descriptions of some new species of Syrphidae. [5] 48: 149-165, ill. **Knowlton & Stains**—Robberfly attacks grasshoppers. [19] 37: 42. **Lindeman, R. L.**—Seasonal distribution of midge larvae in a Senescent Lake. [119] 27: 428-444, ill. **Power, M. L.**—Giant chromosomes in the larvae of Cynomya cadaverina (Metopiid.). [Univ. Oklahoma Bull.] No. 850: 107. **Reinhard, H. J.**—Notes on Fabriciella with descriptions of five new species (Tachinid.). [19] 37: 24-30, ill. **Wilcox & Martin**—Change in name in Diptera. [19] 37: 35.

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Thysania zenobia at Woods Hole, Massachusetts (Lepid.: Noctuidae).

A *Thysania zenobia* Cramer was picked up on the lawn of the Marine Biological Laboratory, Woods Hole, Mass., Sept. 1, 1941. It was battered, appearing as if it had been crushed into the radiator of an automobile. Although dead, it was still fresh and limp. The identification made at the time by Dr. Eleanor Slifer has been subsequently confirmed by Mr. Sherman Moore of Detroit. This incidence of *T. zenobia* so far north is unusual, but not unique.—IVOR CORNMAN, Dept. Zoology, University of Michigan.

OBITUARY.

The death of Dr. C. HART MERRIAM, founder in 1885 and and until 1910 Chief of the United States Bureau of Biological Survey (now known as the Fish and Wild Life Service), on March 19, 1942, at the age of eighty-six years, was announced in *Science* for March 27. His proposed life-zones for North America (1889) have had much influence in zoo-geographic work by entomologists and others. A discussion of them by Prof. R. F. Daubenmire, of the University of Idaho, with an accompanying bibliography, appeared in *The Quarterly Review of Biology* for September, 1938.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

Wanted—Living specimens of the luminous beetle **Phengodes** this summer. E. Newton Harvey, The Biology Dept., Princeton University, Princeton, New Jersey.

I want to collect Rothschildia, agapema, gulfina and io moths and Texas butterflies for interested persons. Eula Frizzell, R 4 San Benito, Texas.

Wanted—Specimens of the genus Trox from North America. Will exchange or determine for duplicate material. Mark Robinson, 231 Cherry St., Sharon Hill, Pennsylvania.

Lepidoptera—From the South, including P. palamedes, T. halesus and E. jucunda to exchange for fauna from other localities. H. W. Eustis, Woodbine Rd., Lakemont, Augusta, Georgia.

Wanted—Egg cases of preying mantids. Correspondence desired with those who will collect. Osmond P. Breland, Department of Zoology, The University of Texas, Austin, Texas.

Wanted—To buy, specimens of bees of the genus **Nomada**, any quantity, especially North American. Quote price, locality. Hugo G. Rodeck, University of Colorado Museum, Boulder Colorado.

Arctic Lepidoptera especially **Noctuidae**—Wanted to hear from collectors who desire the Arctic Species. Have large collection. R. J. Fitch. Lloydminster, Saskatchewan, Canada.

Wanted—Tropical Lepidoptera and Insects. Also domestic species. Will exchange or buy specimens. M. A. Zappalorti, 253 Senator Street, Brooklyn, N. Y.

Wanted—Specimens of the genus Calendra (Sphenophorus) from North America. Will exchange Eastern U. S. Calendra or other Coleoptera for desired species. R. C. Casselberry, 302 Lincoln Avenue, Lansdowne, Penna.

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